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April 27, 2010

Brandon Perkins, Task Monitor
United States Environmental Protection Agency
1200 Sixth Avenue, Mail Stop ECL-112
Seattle, Washington 98101

Re: Contract Number: EP-S7-06-02
Technical Direction Document Number: 09-09-0004
Final South Tacoma Channel Seep Preliminary Assessment

Dear Mr. Perkins:

Enclosed please find the final preliminary assessment report for the South Tacoma Channel Seep, which is located in Tacoma, Washington. If you have any question regarding this submittal, please call me at (206) 624-9537.

Sincerely,
ECOLOGY AND ENVIRONMENT, INC.

Linda E. Costello

Linda Costello
START-3 Project Leader

cc: Renee Nordeen, Project Manager, E & E, Seattle, Washington

South Tacoma Channel Seep
Preliminary Assessment

Technical Direction Document
Number 09-09-0004

April 2010

Prepared for:
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
1200 Sixth Avenue
Seattle, Washington 98101

Prepared by:

ECOLOGY AND ENVIRONMENT, INC.
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List of Abbreviations and Acronyms

Acronym	Definition
BNSF	Burlington Northern Santa Fe
CDA	City Directory Abstract
DCE	trans-1,2-dichloroethene
DOH	(Washington State) Department of Health
E & E	Ecology and Environment, Inc.
Ecology	Washington State Department of Ecology
EDR	Environmental Data Resources, Inc.
EPA	United States Environmental Protection Agency.
FFS	Focused Feasibility Study
FS	Feasibility Study
gpm	gallons per minute
MCL	maximum contaminant level
NPL	National Priorities List
OUs	Operable Units
PA	Preliminary Assessment
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
ppb	parts per billion
ppm	parts per million
RI	Remedial Investigation
ROD	Record of Decision
START	Superfund Technical Assessment and Response Team
SVOC	semivolatile organic compound
TCE	trichloroethene
TDL	Target Distance Limit
TPCHD	Tacoma Pierce County Health District
VOCs	volatile organic compounds
WAC	Washington Administrative Code

1 Introduction

Ecology and Environment, Inc., (E & E) was tasked by the United States Environmental Protection Agency (EPA) to provide technical support for completion of a Preliminary Assessment (PA) at the South Tacoma Channel Seep site in Tacoma, Washington. E & E completed PA activities under Technical Direction Document Number 09-09-0004, issued under EPA, Region 10, Superfund Technical Assessment and Response Team (START)-3 Contract Number EP-S7-06-02.

The specific goals for the South Tacoma Channel Seep PA identified by the EPA are to:

- Determine the potential threat to public health or the environment posed by the site
- Determine the potential for a release of hazardous constituents into the environment
- Determine the potential for placement of the site on the National Priorities List (NPL).

Completion of the PA included reviewing existing site information, collecting receptor information within the range of site influence, determining regional characteristics, and determining potential sources of contamination. This document includes a discussion of background site information (Section 2), a discussion of migration/exposure pathways and potential receptors (targets; Section 3), a summary of the assessment (Section 4), and a list of pertinent references (Section 5).

2 Site Background

2.1 Site Location

Site Name:	South Tacoma Channel Seep
CERCLIS ID Number:	WAN001002824
Site Address:	Near 800 block of South Tacoma Way
Latitude:	47° 13' 55.02 North
Longitude:	122° 26' 49.59" South
Legal Description:	Range 3 East, Township 20 North, Section 8
Parcel Number	0320084118
County:	Pierce
Congressional District:	9
Site Owner(s):	Central Puget Sound Regional Transit Authority 401 South Jackson Street Seattle, Washington 98104

2.2 Site Description

The South Tacoma Channel Seep is the location of a naturally occurring seep in the 800 block of South Tacoma Way in Tacoma, Washington (Figure 2-1). The seep is located approximately 1 mile southwest of the Thea Foss Waterway. The seep is used as a drinking water source by indigent people (Perkins 2009). The seep was identified during sampling in 2005 conducted by the Washington State Department of Ecology (Ecology). During the sampling, volatile organic compound (VOC) contamination was detected in the seep. The seep was being sampled as part of continuing ground water monitoring for the Commencement Bay – South Tacoma Channel Superfund Sites. The Commencement Bay – South Tacoma Channel Superfund Sites and their relationship to the South Tacoma Channel Seep are discussed in further detail below.

2.3 Ownership History

The property on which the seep is located currently is owned by the Central Puget Sound Regional Transit Authority. The property was purchased from the Burlington Northern Santa Fe Railway Corporation (BNSF) on September 28, 2004 as part of the Tacoma to Lakewood Commuter Rail Project. Information regarding ownership history prior to this transfer could not be located; however, based on a license agreement between Central Puget Sound Regional Transit Authority and the City of Tacoma, it appears that BNSF has owned the property since at least 1961 (the year that a permit was issued to BNSF by the City of Tacoma) (City of Tacoma 2007; Pierce County 2010).

2.4 Potential Sources of Contamination

E & E identified all businesses located near the seep, focusing on those that may store or use VOCs in daily operations. Twenty business addresses were initially identified, with eight of those locations having a likelihood of storing or using VOCs (Figure 2-2). E&E then obtained a city directory abstract (CDA) from Environmental Data Resources, Inc. (EDR). The CDA listed the occupant of each of the eight addresses in five-year increments as far back as 1960 for selected addresses. In addition to the CDA, Certified Sanborn Maps were utilized to track the historical property usage for the eight potential source locations. Sanborn Maps were obtained for 1969, 1950, 1912, and 1869.

The following list summarizes the locations that may be potential sources of VOC contamination to the ground water seeps near South Tacoma Way.

- **1002 S. 30th Street**: Based on the Sanborn Maps, structures appear at this address as early as 1896. The maps prior to 1969 do not describe the nature of the businesses associated with the structures; however, a hotel supply company label for the structure is on the 1969 map. The structure appears as one building comprising both this address and 1016 S 30th Street. The EDR report indicates that the current occupant, Campbell Cox Floor Covering, has occupied the structure since at least 1992. Patrick Hart, Inc. (a hotel and restaurant equipment company) occupied the structure from at least 1971 until at the latest 1992 (EDR 2009a; b). It is possible that the current occupant may use or store chemicals containing VOCs that are used for affixing flooring.

- **1016 S. 30th Street**: Based on the Sanborn Maps, structures appear at this address as early as 1896. The maps prior to 1969 do not describe the nature of the businesses associated with the structures; however, as noted above, a hotel supply company label for the structure is on the 1969 map. The structure appears as one building comprising both this address and 1002 S 30th Street. The EDR report indicates that the current occupant (Emerald City Weather Proofers) has occupied the structure since at least 2008. Prior occupants include Floor Coverings International (2002), Servicemaster (1997 to 2002), North Coast Electric Company (1987), HD Baker Company, a warehouse (1981), and Associated Grocers, Inc. (1971 and 1976). The structure was vacant in 1992 (EDR 2009a; b)

- **1022 S. 30th Street**: Based on the Sanborn Maps, structures appear at this address as early as 1896. The maps prior to 1969 do not describe the nature of the businesses associated with the structures; however, the 1969 map indicates the structure is a wholesale grocery warehouse. The current occupant, Michael Myers AED, LLC (an automobile repair service) is not listed in the EDR reports; therefore, it is assumed the business has been at this location only since 2008 (the first year listed on the EDR report). Prior occupants include Genes Towing, Inc. (2002 and 2008), Core-Mark Distributors, Inc. (1997), Kam Consulting and Construction Management and Williams Roofing Company (1987), and Kam Construction Inc. (1971, 1976, 1981, and 1987

(EDR 2009a; b). Solvents may be used or stored at this facility for use as parts degreasers.

- **1102 S. 30th Street**: Based on the Sanborn Maps, Amusement Mach. Repg. occupied this address as early as 1969. The structure does not appear on Sanborn Maps prior to 1969. The current occupant, Airgas Carbonic, is not listed in the EDR reports; therefore, it is assumed that this business has occupied this location since at least 1997 (the first year listed on the EDR report). Previous occupants include American Dry Ice Corporation (1987, 1992, and 1997) and Sportland Amusement Inc. (1976 and 1981) EDR 2009a; b). Airgas may store chemicals at the facility that contain VOCs or solvents.

- **1114 S. 30th Street**: The Sanborn Maps indicate this structure was a pipe shed on the 1969 map. No structure is apparent on any earlier maps. The current occupant, United Pipe and Supply, Inc., has occupied the structure since at least 1997 (the earliest year, as presented in the EDR report). Previous occupants include Aviation Pumps and Pipes and Environmental Products (1992), United Supply Company (plumbing supplies [1987]), Tacoma Plumbing Supply Company (1976), and United Supply Company (1976, 1971, and 1966; EDR 2009a; b). United Pipe and Supply may store or use solvents for use in cleaning plumbing equipment.

- **1212 S. 30th Street**: The Sanborn maps do not depict a structure at this location. The current occupant, Center Electric, appears to have occupied the structure since at least 1971 (the earliest date in which a company is listed in the EDR reports). Additionally, in the EDR reports, Center Electric, Inc. is listed as a motors company (EDR 2009a; b). Based on the information that Center Electric is a motors company, it is possible that solvents are used or stored on the property for use in degreasing motor parts.

- **1108 Center Street:** The Sanborn map for 1969 does not include this location; however, the 1950 map does depict a structure. The nature of the business conducted in 1950 is not indicated on the map. The current occupant, LDI Auto Paints and Equipment, appears to have occupied the structure since at least 1997 (the earliest year, as presented in the EDR report). Previous occupants include Specialized Hobbies (1997 and 2002), Lacquer Distributors (paint supplier; 1992, 1987, 1981, 1976, and 1971), and Northwest Crankshaft Service (auto repair [1966 and 1960]) EDR 2009a; b). It is possible that solvents are used or stored at the facility for use in degreasing automobile parts.

- **1012 Center Street:** This structure is not presented on any of the Sanborn maps and the 1969 map does not cover the area where this structure is located. The current occupant, Superior Linen Service, has occupied the structure since at least 1971 (the earliest year, as presented in the EDR report). Previous occupants include Pantorium Supreme Cleaners (1976, 1966, and 1960), Home Service Company (1966), Tacoma Linen Supply (1966),

Tacoma Superior Laundry (1966), Regal Cleaners (1960), Superior Service Laundry (1960), and Supreme Cleaners and Launderers (1960; EDR 2009a; b). It is possible that TCE is currently or in the past has been used or stored at the facility for use in dry cleaning linens.

2.5 Previous Investigations

No known formal previous investigations of this site have been conducted; however, numerous investigations of other sites in the area have been conducted. The seep was discovered during sampling conducted by Ecology in 2005. During that sampling event, water was collected from the seep and analyzed for VOCs by EPA Method 8260 at the EPA Manchester Environmental Laboratory in Manchester, Washington. The seep was again sampled in June 2008. The initial sample results indicated the presence of VOCs, including trichloroethene (TCE) at a concentration that exceeded the EPA Safe Drinking Water Act federal maximum contaminant levels (MCLs). The seep was again sampled by Ecology in June 2008. These sample results also indicated the presence of TCE at a concentration that exceeded the MCL. The analytical results for these samples are presented in Table 2-1.

The following text describes the investigations that have been conducted at nearby sites.

2.5.1 Commencement Bay – South Tacoma Channel Superfund Sites

The Commencement Bay South Tacoma Channel Superfund Sites encompasses a 2.5 square mile area in Tacoma, Washington. The sites have been subdivided into three distinct project areas for management. The three project areas, also referred to as Operable Units (OUs), are the Tacoma Landfill, the South Tacoma Field, and Well 12A. The sites were proposed for listing on the NPL in December 1983 and finalized for listing in September 1983. The project area that is nearest to the South Tacoma Channel Seep is Well 12A, which is approximately 1.3 miles south-southwest of the seep. The other two OUs are sufficiently distant from the site that they are not expected to be affecting or be affected by the South Tacoma Channel Seep. For this reason, these two OUs are not further discussed in this PA (EPA 2010)

2.5.1.1 Well 12A

The Well 12A OU includes the contaminated well and the source of contamination of the well, the former Time Oil Company. Well 12A is located on Pine Street between 38th Avenue and South Tacoma Way (Figure 2-3). Current land use around well 12A is commercial and industrial. (EPA 2008)

Ground water in the area is used as a drinking water source for the City of Tacoma. Well 12A is one of 13 wells operated by the City of Tacoma in a well field that provides approximately 40% of the summer drinking water supply to the city. The dominant ground water flow direction is to the southwest when drinking water wells are producing and to the northeast when drinking water wells are not producing. Well 12A is located within the South Tacoma Ground

Water Protection District, which is a special zoning overlay district managed by the Tacoma Pierce County Health Department (TPCHD). (EPA 2008)

Site Discovery:
On four different occasions between July and September 1981, chlorinated organic solvents were detected in Well 12A in parts per billion (ppb) concentrations that were above drinking water criteria. As a result, the City of Tacoma Water Department removed well 12A from production in September 1981. (EPA 2008)

Phase I Remedial Investigation:
A Remedial Investigation (RI) was conducted in April 1982 to determine the source, type, and extent of contamination at Well 12A. Eleven ground water wells were installed and the results of subsequent ground water sampling and analysis revealed the following contaminants of concern:

- 1,1,2,2-tetrachloroethane (1,1,2, 2-PCE) – ranging from 17 to 300 ppb;
- Trans-1,2-dichloroethene (DCE) – ranging from 30 to 100 ppb;
- Trichloroethene (TCE) – ranging from 54 to 130 ppb; and
- Tetrachloroethene (PCE) – ranging from 1.6 to 5.4 ppb.

The results of the RI also determined that the major source of contamination in the well was located generally northeast of Well 12A. The RI concluded that continued pumping of Well 12A could capture the contaminant plume even if other production wells were pumping. This meant that Well 12A could provide a hydraulic barrier to the spread of contamination and protect the rest of the well field. If Well 12A was not pumped to provide a hydraulic barrier, it was hypothesized that other operating wells could be impacted by the contaminant plume and could not be used for drinking water use. (EPA 2008)

Focused Feasibility Study:
In January 1983, the EPA conducted a Focused Feasibility Study (FFS) to determine the most cost-effective treatment for Well 12A that would protect the drinking water supply for the City of Tacoma. The study included an Endangerment Assessment that evaluated the risks to the general population if no action was taken. The FFS recommended that a pump-and-treat system with air stripping be implemented on an interim basis. Carbon adsorption was also considered but was more expensive and so was eliminated from further evaluation (EPA 2008)

Record of Decision:
On March 18, 1983, EPA signed a Record of Decision (ROD) for an Initial Remedial Measure. The ROD called for the design and construction of five air stripping towers at Well 12A operating in parallel to treat up to 3,500 gallons per minute (gpm) of contaminated ground water. The ROD required treatment to be sufficiently protective of either consumption of aquatic life if discharged either to Commencement Bay or to the city's sanitary sewer system. Construction of the treatment system was authorized in March 1983 and system startup occurred in

July 1983. The system was operated by the City of Tacoma until early November, when production from the well field for peak demand was no longer needed. Since this time, operation of the treatment system has continued on a seasonal basis (during peak demand) to reduce impacts on the remaining well field and is planned to continue until remediation is complete. (EPA 2008)

Phase II Remedial Investigation/Feasibility Study:
Because the Phase I RI identified only a general source location, the EPA authorized a study of historical solvent use and disposal practices in the suspect area in December 1982. This work included document review and interviews of owners of businesses in the vicinity of Well 12A. Businesses that might have used perchloric acid (PCA) were the focus of the interview. PCA was selected because fewer businesses nearby used PCA, reducing the number of potential sources of contamination. In May 1983, the EPA authorized a supplement RI/Feasibility Study (FS) to further define the extent of ground water contamination and to attempt to locate the source. One of the properties identified during this work was the Time Oil Company. The Time Oil property had been used in the past for various industries , including oil recycling and paint and lacquer manufacturing. Oil recycling and solvent processing began in the early 1920s and continued until 1991 with occasional interruptions due to changes in ownership and a large fire in 1976. Four monitoring wells were installed and sampled. Ground water located near the Time Oil Company property contained concentrations of TCE, PCA, and trans-1,2-DCE in the low parts per million range (ppm) range, which was substantially higher than the detections in other wells and orders of magnitude higher than concentrations in Well 12A. It was determined these monitoring wells were at or near the source of contamination. Subsequently, the EPA collected air and surface soil samples north of the Time Oil Property on a BNSF rail spur. The air sampling results indicated low levels of contaminant; however, the soil samples contained "significant" concentrations of TCE and PCA, which confirmed the property as the source of contamination (EPA 2008)

Time Oil ceased operations at the facility in 1991. Currently the facility is used to store heating, ventilation, and air conditioning equipment. Pumping and air-stripping of Well 12A also continues during peak usage months. (EPA 2008)

2.5.2 Commencement Bay – Nearshore/Tideflats

The Commencement Bay Nearshore/Tideflats site covers 12 square miles and includes more than 300 active businesses and approximately 500 identified point and non-point sources of contamination. This site is also divided into project areas for management. The project areas are:

- Asarco Tacoma Smelter
- Ruston/North Tacoma Study Area
- Tacoma Tar Pits
- Tideflats Areas.

Of these project areas, the Tideflats areas are further divided into the following sub-areas:

- St. Paul Waterway
- Sitcum Waterway
- Hylebos Waterway
- Middle Waterway
- Olympic View Resource Area
- Thea Foss and Wheeler-Osgood Waterways
- Puyallup Land Settlement
- Source Control.

Of these waterways, the Thea Foss Waterway is nearest to the South Tacoma Channel Seep site. Although this site is most likely not connected to the South Tacoma Channel Seep, it is discussed here because of its proximity to the Channel Seep site and because of the nature of the cleanup.

2.5.2.1 Thea Foss Waterway

The Thea Foss Waterway is the westernmost waterway in Commencement Bay. The Thea Foss Waterway is oriented north/south. The land adjacent to the waterway primarily was industrial from the 1890s to the 1980s. Contaminants associated with the waterway include metals, semivolatile organic compounds (SVOCs), and polychlorinated biphenyls (PCBs). Cleanup activities associated with the waterway have included source-control actions and dredging sediments in the waterway. (September EPA 2004)

3 Migration/Exposure Pathways

The following sections describe the migration/exposure pathways and potential targets within the site's range of influence (Figure 3-1). Because this site consists only of a seep, the nearest water body is greater than one mile, and exposed contaminated soil is not known to be present, only the ground water migration pathway is being evaluated.

3.1 Ground Water Migration Pathway

The target distance limit (TDL) for the ground water migration pathway is a 4-mile radius that extends from the sources at the site. Figure 3-1 depicts the ground water 4-mile TDL. The South Tacoma Channel Seep is located over the Central Pierce County sole source aquifer system.

3.1.1 Geologic Setting

Consolidated and unconsolidated rock characterizes the geology in the general area of the site, with several types of formations that have very different characteristics and origins. The consolidated rocks are, for the most part, the oldest in the area (Eocene to Miocene in age) and constitute the bedrock upon which the younger unconsolidated rocks were deposited (Walters and Kimmel 1968).

One formation that likely underlies the site is the Salmon Springs drift. This is a third glaciation that has been discovered in the area. The drift consists mostly of stratified sand and gravel containing thin, discontinuous beds of silt and clay. Lenses of till are present but no extensive single till sheet has been found. The unit is derived principally from the central Cascades, but sediments of northern derivation are common, and sediments of Mount Rainier provenance are abundant locally in some horizons. The unit is commonly oxidized to a yellowish- or reddish-brown in the zone of aerations. Where oxidized in the zone of saturation, the unit is compact, and springs occur as a result of the low permeability of the compacted materials (Walters and Kimmel 1968).

Another formation that is likely to underlie the site is the Kitsap Formation, which is composed of beds of fluvial and marsh deposits derived principally from older Pleistocene age deposits and from Mount Rainier sources. In most of the area, the formation consists of three parts: unoxidized sand and gravel at the base, fine-grained material in the middle, and oxidized sand and gravel at the top. The formation unconformably overlies drifts of probable Salmon Spring age. The basal gravel is brownish-black and of unknown thickness. Overlying this deposit are beds of clay, silt, and fine sand that contain, near the top, discontinuous peat

layers. The color of most of the clay and silt deposits is yellowish-brown or yellowish-orange; some silty, sandy clay is a grayish-blue-green. The Kitsap Formation was deposited in a nonglacial climate during an interval between glaciations. Evidence of both alluvial and lacustrine environments is present in most exposures of the formation. The presence of sediments derived from Mount Rainier indicates that the Puget Sound Lowland was free of ice, thus permitting northward drainage toward the Strait of Juan de Fuca during accumulation of the materials that compose the formation. The following is a typical horizon of this formation with thickness in feet (Walters and Kimmel 1968).

Material	Thickness (feet)
Gravel - cobble, yellowish-brown, compact; Mount Rainer central Cascade and northern Cascade provenance	7
Clay - silty yellowish-brown, with thin, fine, sand beds	1.5
Peat	0.2
Clay - organic-rich and black at top, grades downward into dark yellowish-orange	1.5
Sand - pale yellowish-brown; mainly of Mount Rainier provenance	1.2
Gravel and sand - dark yellowish-orange, compact; contains rocks of Mount Rainier, central Cascades, and northern Cascades provenance. Sand mainly of Mount Rainier provenance	24
Covered	6
Probable Erosional Unconformity	
Clay - dark yellowish-orange, contains thin sand beds	2
Sand - pale yellowish-brown and moderate yellowish-brown	4.5
Clay - pale yellowish-brown to grayish-orange	1.0
Sand - fine, pale yellowish-brown	0.8
Clay - dark yellowish-orange, massive	2.4
Gravel - pebble to cobble, containing sand lenses near the top, generally unoxidized and brownish-gray, Mount Rainier, central Cascades, and northern Cascades provenance, many reworked stained pebbles	20+
Exposed thickness of Kitsap Formation	74 +

3.1.2 Aquifer System

The Central Pierce County aquifer system consists primarily of unconsolidated sediment deposited by glaciers and associated meltwater during the Quaternary Period. The ground water moves regionally toward Puget Sound and the river valleys that constitute the aquifer system boundaries. Locally, the direction and gradient of ground water movement can vary dramatically from the overall regional trend. (EPA 1998)

Depth to ground water varies from zero to hundreds of feet. Deep wells drilled within the area penetrate multiple productive aquifers of permeable glacial

outwash separated by relatively impermeable aquitards of glacial till or non-glacial sediments. The degree of hydrologic connection between individual aquifer units can vary greatly. (EPA 1988)

The site is located in the northeastern portion of the Tacoma Upland. Ground water in this area is recharged by precipitation. Ground water flow is controlled by the geology and topography in the area. The unconsolidated glacial drift and alluvium that underlie the area contain aquifers of high porosity and permeability and yield large amounts of water (Griffin and Sceva et al.1962).

The sand and gravel aquifers are discontinuous and occur as lenses and, therefore, the amount of water available differs from place to place. The outwash sands and gravels of the Vashon glaciation comprise the best aquifers in the area. In general these deposits do not extend more than 200 to 300 feet below the surface (Griffin and Sceva et al. 1962).

In the Tacoma Upland, outwash sands and gravel deposits and the underlying pre-Vashon (Kitsap Formation) unconsolidated deposits include the most productive aquifers. Glacial till and the older semi-consolidated sediments generally yield only small amounts of water (Griffin and Sceva et al. 1962).

Part of the Tacoma Upland is mantled by till from the Vashon glaciation in an unsorted mixture of clay, silt, sand, gravel, and boulders, which was deposited during the last glacier advance into the Tacoma area. The till is generally light gray, almost having the appearance of concrete, and does not form a productive aquifer. However, in areas where till is sufficiently thick (20 to 30 feet) it can yield a small amount of water in large-diameter wells (Griffin and Sceva et al. 1962).

The outwash deposits, consisting mostly of coarse sands and gravels, form the most productive aquifers in the Tacoma Upland. These deposits were deposited by meltwater streams during both the advance and recession of glaciers. The recessional outwash material in this area is mostly coarse gravel and ranges from a few feet to more than 200 feet thick. The advance outwash materials, which are as much as 100 feet thick, generally contain a larger proportion of sand than the recessional outwash (Griffin and Sceva et al. 1962).

For the Tacoma area as a whole, the contact between the Vashon-age deposits and the pre-Vashon unconsolidated deposits is unconformable. This contact ranges from 700 feet above sea level to as much as 300 feet below sea level (Griffin and Sceva et al. 1962).

3.1.3 Drinking Water Targets

Approximately 164,040 people use ground water for drinking water purposes within the 4-mile TDL. A combination of Group A and Group B community water systems and domestic wells are present. The Washington Administrative Code (WAC) defines the group designation for community water systems. Water

system group definitions as provided by the Washington State Department of Health (DOH) are as follows:

> **Group A.** (WAC 246-290). Group A water systems are those with fifteen or more service connections, regardless of the number of people, or systems serving an average of twenty-five or more people per day for sixty or more days within a calendar year, regardless of the number of service connections. Group A water systems do not include systems serving fewer than fifteen single-family residences, regardless of the number of people.
>
> **Group B** (WAC 246-291). Group B water systems serve fewer than 15 residential connections and fewer than 25 people per day or 25 or more people per day less than 60 days per year. Group B water systems are those public water systems that do not meet the definition of a Group A water system.

The Washington State DOH maintains records of all active public water systems. Public water systems, regardless of group designation, indicate the total number of wells in the system, number of connections, and total population served. A search of the DOH Sentry Internet database revealed that seven Group A community well systems serve a total population of 164,040 people and ten Group B community wells serve a total population of 53 people (DOH 2009). All of the Type B wells are located from 3 to 4 miles of the site. Wells and associated population are presented by distance ring in Table 3-1.

The Elmwood Mobile Manor maintains one well which serves a population of 60 residents. This well is located 2 to 3 miles from the site.

The Valleybrook Village maintains one well which serves a population of 65 residents. This well is located 2 to 3 miles from the site.

The Tacoma Country Estates maintains one well which serves a population of 231 residents. This well is located 3 to 4 miles from the site.

The Golden Valley water system maintains a well system consisting of two wells, both of which are located within the TDL. The total population served is 200 people. Neither of the wells contributes more than 40% of the total capacity; therefore, each well is assumed to serve approximately 100 people. Both wells are located between 3 to 4 miles of the site.

The Fife Department of Public Works maintains a well system of five wells. All of these wells are emergency wells and are used in the summer months. The City of Fife has an intertie system with the City of Tacoma Water Division. Of these five wells, one is located within the TDL. The population served by the system totals 7,610 people. No well supplies more than 40% of the total capacity; therefore, each well is assumed to serve 1,522 people (7,610 people / 5 wells). All of these wells are located between 3 to 4 miles of the site.

The City of Fircrest maintains a well system consisting of seven wells. All of the wells are located within the TDL. One of these wells is an emergency well that is maintained and used at least once per year. The population served by the system totals 6,080 people. No well supplies more than 40% of the total capacity; therefore, each well is assumed to serve 869 people (6,080 people / 7 wells). Three of the wells are located between 2 to 3 miles of the site and four of the wells are located between 3 to 4 miles of the site.

The City of Tacoma maintains a system consisting of 32 sources, including 30 wells, a water intake on the Green River, and a spring. Sixteen of these wells are located within the TDL; one of the wells is permanent, 14 are seasonal, and one is an emergency well. Both the permanent and seasonal wells are maintained and used annually, generally in the summer months. None of the wells contribute more than 40% of the total capacity of the system. The system serves a total population of 311,500 people; therefore, each well serves 9,734 people (311,500 people / 32 wells and intakes). Five of the wells are located within a 1- to 2-mile radius, three wells are located within a 2- to 3- mile radius, and eight wells are located within a 3- to 4-mile radius.

Finally, a total of 52 domestic drinking water wells are present within the TDL. The average number of people per household for Pierce County, Washington is 2.60 (DOC 2001). Based on this, it is estimated that approximately 135 people use drinking water from a domestic well source. Drinking water population by distance ring is presented in Table 3-1.

A designated wellhead protection area is present at the site.

4 Summary and Conclusions

The South Tacoma Channel Seep is the location of a ground water seep that contains VOCs at concentrations that exceed federal drinking water standards. The source of the contamination is not known at this time approximately eight potential sources of contamination are located in the vicinity of the site. Additionally, this site is near two current NPL sites: the Commencement Bay – South Tacoma Channel Superfund Sites and the Commencement Bay Nearshore/Tideflats site. It is possible that contamination from any of these sites may be impacting contamination at the seep. The seep is reported to be currently used as a drinking water source for indigent people.

Finally, ground water targets near the seep may be potentially impacted by this contamination. Nearby ground water targets include many municipal and domestic drinking water sources that are within the Central Pierce County sole source aquifer.

5 References

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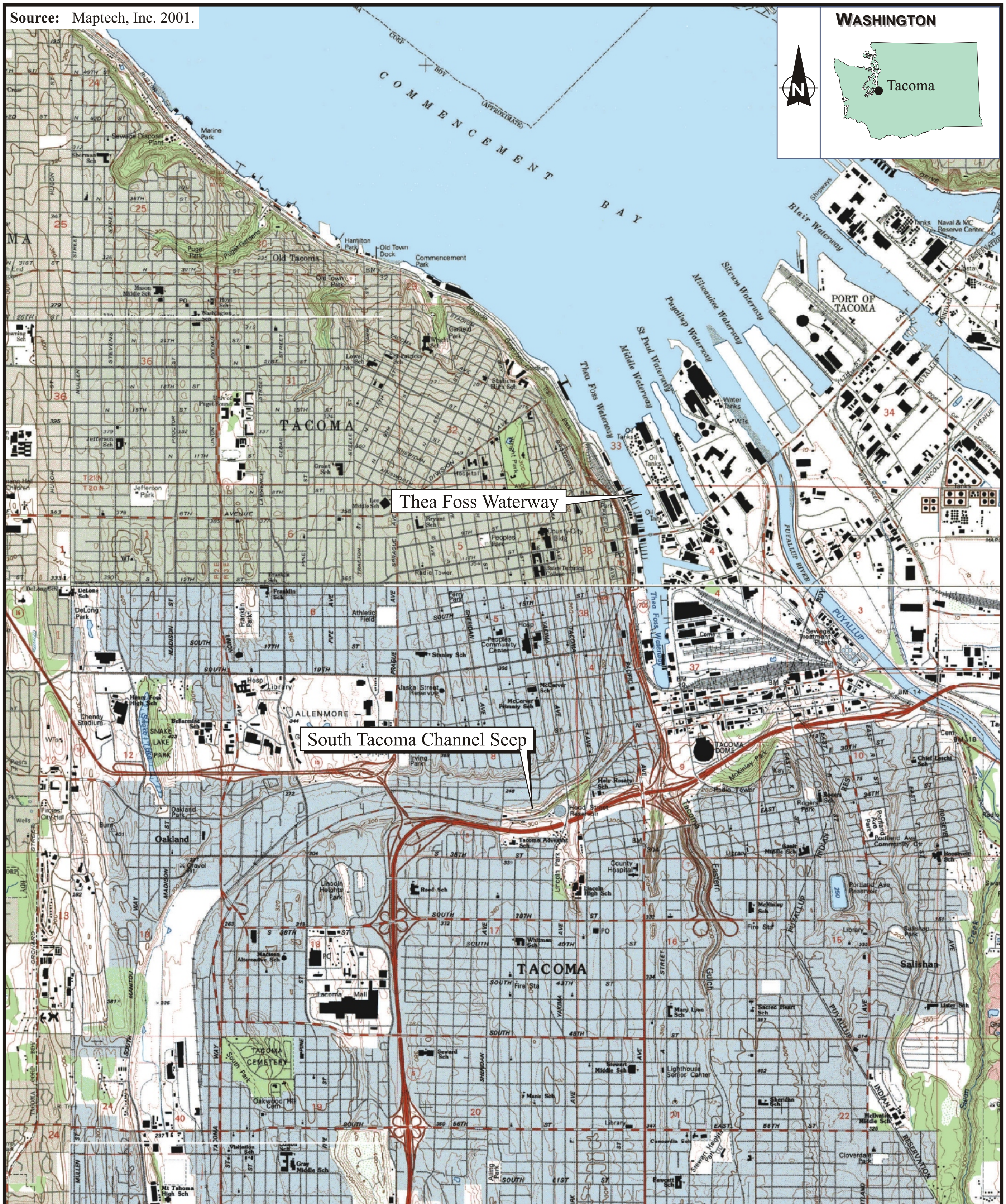
Figures



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SOUTH TACOMA CHANNEL SEEP
Tacoma, Washington

0 2000 4000
Approximate Scale in Feet

Figure 2-1

SITE VICINITY MAP

Date: 3-25-10

Drawn by: AES

10:START-3\09090004\fig 2-1

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Figure 2-2
POTENTIAL SOURCE LOCATIONS

0 125 250
Approximate Scale in Feet

Date: 3/25/10

Drawn by: AES

10:START-3\09090004\fig 2-2

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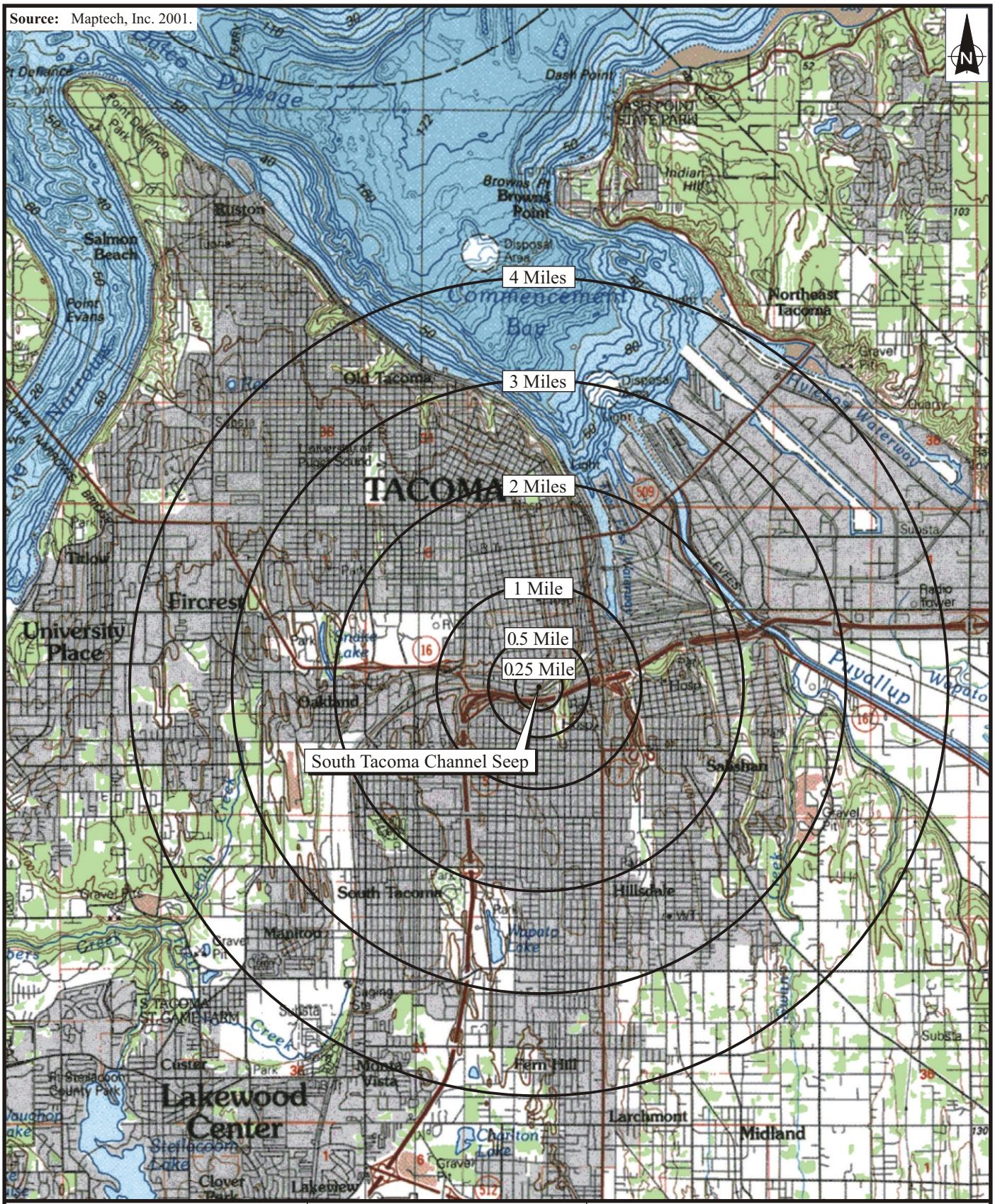
Figure 2-3
WELL 12A LOCATION

0 854 1708
Approximate Scale in Feet

Date: 3/25/10

Drawn by: AES

10:START-3\09090004\fig 2-3



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	SOUTH TACOMA CHANNEL SEEP Tacoma, Washington	Figure 3-1 4-MILE MAP		
	0 .5 1 Approximate Scale in Miles	Date: 12-17-09	Drawn by: AES	10:START-3\09090004\fig 3-1

Tables

Table 2-1 Seep Sample Analytical Results

Sample Number Collection Date	05014000 1/5/05	Seep 1 6/5/08	Seep 2 6/5/08
Trans-1,2-dichloroethene	**2.2**	5.0 U	5.0 U
Cis-1,2-dichloroethene	**0.64 J**	5.0 U	5.0 U
Chloroform	**0.42 J**	5.0 U	5.0 U
Trichloroethene	**24**	**9.5**	**9.9**
1,1,2-trichloroethane	**0.14 J**	5.0 U	5.0 U
Tetrachloroethene	**0.11 J**	5.0 U	5.0 U
1,1,2,2-tetrachloroethane	**0.65 J**	5.0 U	5.0 U

Note: Bold type indicates the sample result is above the instrument detection limit.

Key:
J = Identification of the analyte is acceptable; the reported value is an estimate.
U = The analyte was not detected at or above the reported value.

Table 3-1 Drinking Water Population by Distance Ring

Distance Ring	Number of Wells	Population	Total Population for Distance Ring
0 to ¼ mile	0	0	0
¼ to ½ mile	0	0	0
½ to 1 mile	0	0	0
1 to 2 miles	City of Tacoma – 5 wells	48,670	48,675
	Domestic – 2	5	
2 to 3 miles	Elmwood – 1 well	60	31,963
	Valleybrook – 1 well	65	
	Fircrest – 3 wells	2,607	
	Tacoma – 3 wells	29,202	
	Domestic – 11	29	
3 to 4 miles	Tacoma Country Estates – 1 well	231	83,457
	Golden Valley – 2 wells	200	
	Fife – 5 wells	1,522	
	Fircrest – 4 wells	3,476	
	Tacoma – 8 wells	77,872	
	Group B wells	53	
	Domestic – 39	101	
TOTAL			**164,093**

Source: DOH 2009, DOC 2001, Ecology 2009.